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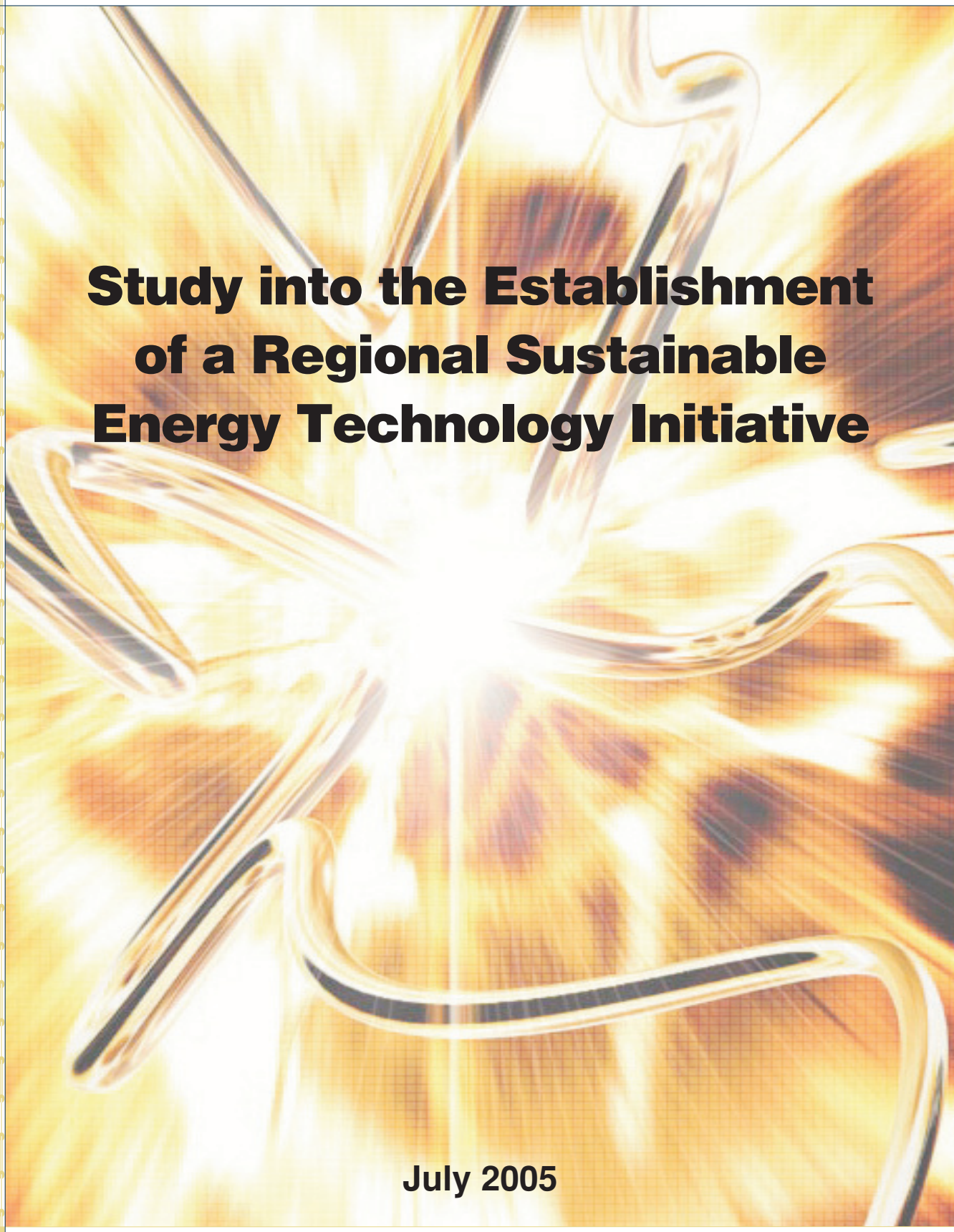

Study into the Establishment of a Regional Sustainable Energy Technology Initiative

July 2005

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Study into the Establishment of a Regional Sustainable Energy Technology Initiative

Discussion Document prepared for

Christchurch City Council and Environment Canterbury

July 2005

This report presents the findings of a preliminary investigation into the feasibility of establishing an organisation to promote and support developers and providers of sustainable energy technologies within the Canterbury region.

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Contents

1 Executive Summary

The Christchurch City Council and Environment Canterbury have asked the Centre for Advanced Engineering to investigate the feasibility of establishing an organisation to promote and support developers and providers of sustainable energy technologies within the Canterbury region. It has been suggested that this organisation carry out functions such as:

1 Facilitate networking between organisations involved in sustainable energy technologies or services.

2 Facilitate knowledge transfer regarding sustainable energy technologies and applications.

3 Act as a pipeline for R&D and start-up funding or, alternatively, offer professional support to organisations seeking such funding.

4 Industry support in respect of overcoming regulatory barriers.

5 Awareness raising and business development support nationally and internationally.

6 Provision of a regional energy brand and sustainable energy standards.

The results from CAE's research, including a review of other similar organisations abroad and a survey of potential members, suggests that Canterbury would benefit from the establishment of such an organisation in terms of its potential to both improve environmental outcomes and increase economic activity for the region. On the basis of the analysis, and after discussions with stakeholders, recommendations are made on the possible form and operating structure of such an organisation.

To allow a more detailed analysis of the business case and to provide for the establishment of the proposed organisation, the following next steps are recommended:

- Formation of a an Establishment Board to advise on implementation options.
- Initiate preliminary discussion to secure the funding and resources required for implementation.
- Realisation of a suitable high-profile project that has as its objective the advancement of a sustainable energy opportunity in the region, and thus, in turn, creating awareness and positive publicity for the formation of the proposed organisation.

2 Introduction

2.1 Background

Canterbury is host to a number of leading research providers and technology developers in the area of sustainable energy provision. The expertise ranges from micro combined heat and power unit development to sustainable land use for biofuel production. Yet, Christchurch has suffered from poor air quality for many years due to, amongst other factors, the widespread use of dated energy conversion technologies, such as open fires for domestic heating.

A particular problem in Christchurch is the concentration of particulates in the air envelope of the city (smog). Environment Canterbury (ECAN) and Christchurch City have both been involved in addressing this issue for some time. In August 2002, ECAN also initiated a "Clean Burning Technology and Sustainable Development Forum" to:

1 identify 'state of the art' clean burning technology; and

2 bring potentially contributing parties together to "work for the future".

The Centre for Advanced Engineering (CAE) participated in this forum and offered to facilitate further investigation of some of the ideas presented at this forum.

CAE's preliminary assessment of the contributions to the forum led to the idea that the establishment of a (cluster type) organisation, providing a range of supporting services to individuals, organisations and institutions involved in the development and application of sustainable energy technologies and services, could benefit:

- Christchurch in terms of its air quality; and
- the Canterbury region as a whole through greater economic activity.

This concept was termed "Sustainable Energy Technology Initiative" (SETI). In broad terms, it was suggested that SETI may:

- Form and facilitate a sustainable energy technology cluster.
- Attract renewable energy investment to the Canterbury region.
- Develop a specialist "clean fuel" market in Canterbury based on new biomaterial processes.
- Offer collaborative marketing and brand development within selected international markets.
- Seek to achieve world-class performance through benchmarking and design excellence in respect of new innovative sustainable energy solutions and appliances.

ECAN and the Christchurch City Council (CCC) consequently commissioned CAE to carry out a feasibility study into the establishment of SETI or some other like organisation. The report presented here is the result of this study.

2.2 Study Scope

The following scope for the study was developed by CAE in conjunction with ECAN and CCC:

1 Identify potential functions to be provided by SETI.

2 Identify potential members of SETI.

3 Research similar initiatives elsewhere.

4 Survey potential members to analyse their needs that may be fulfilled by SETI and better understand the impact SETI could have on the economic activity in the region.

5 Explore options for an organisational structure for SETI.

6 Recommendations on the way forward.

Since its inception, the above mentioned target issues for SETI (i.e. clean air and economic activity in the region) have been interpreted in a broader context. Namely, it was agreed to include the full range of sustainable/renewable energy technologies and services pursued in Canterbury, and not to be limited to those that may have an immediate effect on Christchurch's air quality.

3 Summary of Findings

3.1 Potential SETI Functions

Discussions with various relevant organisations in the region and in-house knowledge at CAE has led to the suggested following list of potential functions that SETI might perform:

1 Facilitate networking between organisations involved in sustainable energy technologies or services.

2 Facilitate knowledge transfer regarding sustainable energy technologies and applications.

3 Act as a pipeline for R&D and start-up funding or, alternatively, offer professional support to organisations seeking such funding.

4 Industry support in respect of overcoming regulatory barriers.

5 Awareness raising and business development support nationally and internationally.

6 Provision of a regional energy brand and sustainable energy standards.

The above possible functions are outlined in more detail below: These functions are not intended to be exclusive, but bring together the thoughts and ideas offered during the course of the research.

Networking and Collaborative Working:

This function was the most preferred option identified by study participants and perhaps reflects the fragmented nature of the industry base as it currently exists in Canterbury. The primary need identified was the organisation of seminars, workshops and forums etc., so as to share ideas and thinking around common topics. This effort could be supported by the publication of a regular newsletter. The function could also be extended to provide common support services to members in general and to act as a facilitator to improve the flow of information between different member categories (e.g. between universities and manufacturers in particular).

Knowledge Transfer:

Knowledge transfer and access to information on new technology development was also a strongly supported function. SETI could act as a clearing-house for the dissemination of not only R&D in the region, but also international developments; e.g. where universities have knowledge of R&D developments overseas through exchange programmes or collaboration, relevant information could be made available to other SETI members. The most obvious medium for the delivery of such services would be through web-based information exchange protocols and other electronic means.

Research and Development Support:

Anecdotal evidence suggests that many of the public funding mechanisms for R&D in NZ are considered difficult to access and manage for small enterprises. Furthermore, successful access to research funding requires track record, relevant expertise and, in general, evidence of research collaboration and route to market.

Depending on its position with regards to other regional and national funding bodies, SETI may be a suitable vehicle to

- either act in a supporting fashion to any member organisation which may seek to receive funding from existing funding agencies; or
- depending on its position relative to such agencies and its own funding, provide more accessible funding to small enterprises in the region.

Regulatory Barriers:

This again was a clearly identified need. Industry players saw the benefit of third party organisation to address practical issues resulting from the implementation of regulation or policy at a regional level. For example, SETI could bring together analysis and comment on problems and opportunities resulting from various regulatory intervention or policy settings related to the uptake of sustainable energy opportunities.

It was considered by many participants, vital that good technical information as well as industry know-how be incorporated into policy analysis and local decision making.

Marketing Support Nationally and Internationally:

Some of the sustainable technology and services developed in Canterbury are unique. Many of the companies involved in these developments have not received the support they would have liked when marketing their technology or service overseas. While New Zealand Trade & Enterprise (NZTE) is principally charged with this task by government, SETI could provide additional expertise regarding the assessment of these technologies through its network of professionals. As such, SETI could offer capability in support of regional development initiatives in the sustainable technologies field.

Provision of a Regional Energy Brand and Sustainable Energy Standard:

To give sustainable energy technology or service providers an obvious point of distinction with regards to their marketing efforts, there was some support for the establishment of a sustainable energy technology/service brand. For a technology/service provider to qualify for this brand, certain sustainability standards, would have to be met. Should such an initiative be ultimately accepted by industry participants then SETI could act as the independent body that owned and administered this brand.

3.2 Potential Members

One of the issues noted at ECAN's original "Clean Burning Technology and Sustainable Development Forum" was the apparent disconnection between the parties involved in policy in respect of Christchurch's clean air issue and those engaged in the provision of energy technologies or services.

This issue has continued to affect local industry views of the importance of supporting technology development and the uptake of new technology. SETI, it is suggested, needs to be an inclusive organisation spanning a broad range of organisations, institutions and individual businesses. The following categories of organisations may thus be considered potential members of SETI:

- Manufacturers:
  - — Clean burning wood burners, both domestic and large scale
  - — Solar water heating equipment
  - — Flue gas cleaning equipment (domestic, commercial and industrial scale)
  - — Heat insulation materials
- Service providers to energy consumers, both large and small:
  - — Energy auditors
  - — Architects
  - — Consultants
- Research providers:
  - — Universities
  - — Crown Research Institutes
  - — Other Research Centres

- Regulatory bodies, Councils and Government Agencies
  - — ECAN
  - — CCC
  - — Canterbury District Councils
  - — EECA
  - — New Zealand Trade and Enterprise
  - — Ministry for the Environment
  - — Foundation Research Science and Technology
- Other regional institutions working with some of the above organisations:
  - — Manufacturer's Association
  - — Employers Chamber of Commerce
  - — Canterbury Development Corporation
  - — Other technology clusters
  - — Regional renewable/sustainable energy initiatives

For a list of companies currently on SETI's database, please refer to Appendix 1).

3.3 Review of Other Similar Organisations Elsewhere

To minimise "reinventing the wheel", an internet search of other similar organisations around the world was carried out as part of this project. Due to the study's limited resource, only the published information on the internet was sighted. No organisation was visited. The only exception was the NZ based initiative (The New Zealand Clean Energy Centre, NZCEC, based in Taupo). However, as the internet appears to be a key communication tool for most, if not all, of these initiatives, this approach was considered sufficient for the purposes of this investigation.

The following initiatives were reviewed:

Name	Country/Region	Brief Description
The New Zealand Clean Energy Centre (NZCEC)	New Zealand/Lake Taupo	The NZCEC - with an initial focus on the geothermal and bioenergy sectors - will foster the growth of both existing and new companies that are positioned to capitalise on these market opportunities.
Northwest Energy Technology Collaborative (NWETC)	USA/Northwest region	A joint effort of business, government, non-profit and educational institutions determined to accelerate the emergence and growth of the energy technology industry in the Pacific Northwest region of North America.
Massachusetts Technology Collaborative (MTC)	USA/Massachusetts	The State's development agency for renewable energy and the innovation economy. It administers the John Adams Innovation Institute and the Renewable Energy Trust. It works to stimulate economic activity in communities throughout the region.
The Clean Energy Incubator™ (CEI)	USA/Texas	CEI offers an environment dedicated specifically to helping young clean energy companies succeed
Innovating Tomorrow's Industry (ITI)	UK/Scotland	An initiative aiming to identify, develop and successfully commercialise new, energy and energy related technologies.
State Initiative on Future Energies	Germany/North Rhine Westphalia	A strategic platform for future energies, consultative forum, framework for action and information and contact and cooperation centre.

There are likely to be more organisations with similar objectives and numerous other initiatives existing around the world which promote renewable/sustainable energy in various ways. However, the above sample focuses on initiatives which have a regional focus and whose objectives include provision of networking for regional companies, research providers and government institutions.

The following section summarise the key attributes for each. A brief description of the following issues is provided, as far as the information was available:

- Ownership structure of initiative.
- Targeted clients/members.
- Objectives.
- Key means to achieve the objectives.
- Internet address.

3.3.1 The New Zealand Clean Energy Centre (NZCEC)

The NZCEC is part of the Lake Taupo Development Company (LTDC), an independent entity contracted by the Taupo District Council.

The NZCEC is initially targeting existing and new companies in the geothermal and bioenergy sector. Its objectives are to foster the growth of these companies through:

- Provision of business development aid.
- Introduction to national and international value chains and incubation services to companies pursuing these market opportunities.
- Collaboration with "Innovation Waikato", an existing innovation centre, providing specialised business services such as commercialisation, IP protection, tax services, business development seminars, links to capital etc.
- Links with established clean energy incubators, universities, etc.
- Facilitation of post-graduate student research.
- Partnerships with geothermal resource owners, developers and operators, forest owners and managers and land owners.

Internet link: www.laketaupodevelopment.com/cleanenergy.html

3.3.2 Northwest Energy Technology Collaborative (NWETC)

The ownership of the NWETC is not explained on its website. However, it states that the NWETC is a joint effort of business, government, non-profit and educational institutions: it is the flagship project of the Washington Technology Center's Industry Initiative Program and was joined by Avista Corporation, Bonneville Power Administration, Inland Northwest Technology Education Center, Pacific Northwest National Laboratory, Puget Sound Energy, Spokane Intercollegiate Research and Technology Institute and the Washington Department of Community, Trade and Economic Development.

Its primary goal is to deliver product and resources to new energy technology companies so that they may grow and flourish in the Pacific Northwest.

This is achieved through three key means:

1 Research and Development

The Research and Development Portfolio comprises initiatives and opportunities to support the collaborations between the region's National Laboratories, R&D Operations and educational institutions as well as initiatives to attain the most research dollars into the Pacific Northwest as possible.

2 Commercialisation Services

The Commercialisation Services Portfolio mission is to provide a forum of resources for new energy technologies and technology businesses, in various stages of the business life cycle, who are selling to the energy industry, particularly in the NW region of the U.S. and Canada. This portfolio is comprised of a number of initiatives that push products through the demonstration phase, initiatives such as establishing testing commitments in the field, showcasing the market-ready product, or preparing companies to present to the venture capital/angel investor community.

3 Regional Branding/Marketing

The regional branding campaign is a portfolio designated to advancing the Pacific Northwest's new energy technology sector to the global market by:

- highlighting the overall volume and quality of players in R&D energy activity in the Pacific Northwest;
- showing the Pacific Northwest's flag as being a world centre for new energy technology innovation;
- creating excitement about the vast energy network in the Pacific Northwest that would interest new energy technology companies involved in R&D to relocate to the region; and
- attracting new investment capital to the Pacific Northwest's new energy sector.

NWETC is creating and executing a regional branding campaign that identifies and promotes the Pacific Northwest's energy cluster to the world.

Internet link: www.nwetc.com

3.3.3 Massachusetts Technology Collaborative (MTC)

The MTC is the State's development agency for renewable energy and the innovation economy, which, according to MTC's internet site, is responsible for one-quarter of all jobs in the state. MTC administers two programmes:

- The John Adams Innovation Institute; and
- The Renewable Energy Trust.

It works to stimulate economic activity in communities throughout the region.

The MTC is an initiative of the Massachusetts Technology Park Corporation (MTPC), an independent subsidiary agency of the Commonwealth created in 1982 to advance the growth of the technology sector of the Massachusetts economy through collaborative activities among industry, universities and state government. MTC is the successor to the Massachusetts Microelectronics Center, MTPC's first public private partnership that addressed the training needs of the state's computer and defence electronics industries.

The MTC is bringing together leaders from industry, academia, and government to advance technology-based solutions.

The Renewable Energy Trust seeks to maximize environmental and economic benefits for the Commonwealth's citizens by pioneering and promoting clean energy technologies and fostering the emergence of sustainable markets for electricity generated from renewable sources. It does this through three programmes and a policy unit:

1 Clean Energy Program

This program seeks to increase both the supply of, and demand for, renewable energy. On the supply side, it supports both utility-scale and community-scale energy projects that harness the wind, sun, and bioenergy. On the demand side, it educates citizens, teachers, and students, and advances the green electricity market by giving consumers objective information and attractive choices.

2 Green Buildings and Infrastructure Program

This program promotes the use of renewable energy technologies in all types of buildings and other distributed applications. It has provided funding to a wide range of green building projects, solar installations, and infrastructure improvements. It encourages efforts that help the marketplace to value and support green buildings and renewable energy installations.

3 Industry Support Program

This program accelerates job growth, economic development, and technological innovation in the Massachusetts renewable energy industry. It makes direct investments to catalyse new product commercialisation, builds networks and provides services that better enable companies to access capital and other vital resources, and strive to lower barriers to success for entrepreneurs in the state.

This program includes two initiatives:

1 Sustainable Energy Economic Development (SEED) Initiative

The Renewable Energy Trust seeks to invest with companies that generally have a key technology but have not yet demonstrated commercial viability to an extent sufficient to attract venture capital. SEED provides capital on reasonable terms for companies undergoing new product development at the critical stage between R&D and the marketplace. Awards range from $50,000 to $500,000 and are available on a competitive basis.

2 Massachusetts Green Energy Fund

MTC has formed a partnership with Commons Capital, locally based venture capital management company, to manage the $15 million Green Energy Fund, which will invest equity venture capital in Massachusetts-based renewable energy companies. This fund is poised to provide an important infusion of capital into the growing clean energy cluster. Massachusetts companies are on the cutting-edge developing the next generation of renewable energy technologies including solar, fuel cells, wind and bioenergy. The Green Energy fund will attract new investment from financial and strategic investors to leverage additional private funds for clean energy companies and entrepreneurs across the state.

The policy unit of the Renewable Energy Trust collaborates with interested stakeholders to address market and regulatory barriers that block the increased availability, use, and affordability of renewable energy.

Internet link: www.mtpc.org

3.3.4 The Clean Energy Incubator™ (CEI)

The Clean Energy Incubator™ (CEI) was launched in August 2001 as a joint effort between the Austin Technology Incubator (ATI) and the National Renewable Energy Laboratory (NREL) to promote the development of viable businesses focused on clean energy. CEI is initially being supported by a grant from the Texas State Energy Conservation Office (SECO) and is working towards additional funding support from the U.S. Department of Energy (DOE) through its relationship with NREL.

CEI's target members are start-up companies in the renewable energy sector. At the same time, it maintains partnerships with various other private and state-funded organisations.

CEI's mission is to help develop early-stage clean-energy companies. CEI strives to help these companies solidify management teams, secure adequate funding, and accelerate time to market. Through this mission, CEI will create jobs and generate wealth for the Austin community and its surroundings.

CEI provides a wide array of services that give its companies a strong competitive advantage over other start-ups. Some of these services include:

- access to advice from leaders in the community and key players in the clean energy industry;

- in-house consulting;
- financing referrals;
- access to CEI's network;
- brand equity and awareness;
- publicity; and
- a convenient turnkey office infrastructure.

While CEI does provide guidance and access to funding, it does not have funds to directly invest in companies.

Internet link: www.cleanenergyincubator.com

3.3.5 ITI Energy

ITI Energy ("innovating tomorrow's industry") is one of three operating groups that make up ITI Scotland. Together with ITI Techmedia and ITI Life Sciences, ITI Energy, which is publicly funded, will be investing in excess of £450 million over the next ten years in research and development. One third of the total amount of funding available is allocated to ITI Energy.

Participation in ITI's activities and projects is open to all businesses and research organisations, regardless of where they are located. ITI is based in Aberdeen, Scotland, but its scope and vision is global. ITI closely follows research activities in other countries, and welcomes involvement and collaboration from overseas.

ITI Energy will select and invest in programmes based on assessing future market needs, identifying technology opportunities, and responding to ideas, initiatives and proposals from the research and business communities. ITI will use its £150 million funding to commission and direct applied research projects in collaboration with partners from industry, academia and finance.

To achieve its goals, ITI will:

- Work with universities and research institutes, companies, entrepreneurs and investors - in Scotland and around the world - to identify future market needs and technology opportunities in the energy sector.
- Provide access, insight and intelligence to members to support their business development.
- Commission and contract new applied research into targeted energy technologies.
- Develop and manage these activities as collaborative programmes involving universities and research institutes, companies and financial partners.
- Protect the IP and assets generated from its investments.
- Commercialise the IP created, accelerating the release of new technology quickly through licensing to start-ups and/or existing small and medium-sized enterprises (SMEs) or larger companies.
- Create new commercial opportunities, enabling businesses to develop more innovative, proprietary, market-driven products and services.
- Become a commercial catalyst for investigating and developing new energy and energy-related technologies.
- Look for opportunities to work with the other ITIs on 'white space' projects – by helping to identify and develop technologies that overlap with research activities and market applications across multiple sectors.

Internet link: www.itienergy.com/index.asp

3.3.6 State Initiative on Future Energies (SIFE)

SIFE was founded and is funded by the state government of North Rhine Westphalia (NRW).

SIFE was founded in 1996. However, the SIFE internet site states that since 1987, more than €560 million have been allocated to more than 46,000 assisted projects in the research, development, demonstration and market launch of new energy technologies in NRW. The State funding has attracted further investment of nearly €2.5 billion.

The SIFE initiative and its services are aimed at any organisation contributing to the development or use of new energy technologies.

SIFE was formed to boost the role of NRW as the most important region for energy-technology in the European Union and to promote the use of renewable energy.

SIFE is realising its objectives through different working groups which look after different energy technologies. It appears that within these work groups, experts of the relevant areas initiate and facilitate research projects and collaborations and administer project funding. A major element is the co-operation between industry and science. For this reason NRW's Solar Group has joined SEFI. SIFE's services also include a yearly conference at which progress from its various working groups and projects are reported on, and an online searchable database listing relevant organisations.

To date, SEFI has been involved in projects in the following areas:

- biomass
- co-generation of power and heat
- decentralized power systems
- energy concepts for specific industries
- energy services
- foreign trade
- fuel cells
- geothermics
- heat pumps
- housing and construction
- hydroelectric power
- hydrogen power
- coal seam gas
- light-emitting diodes (LED)
- photovoltaics
- power plant technologies
- solar heating
- wind energy.

Internet link: www.energieland.nrw.de/

3.3.7 Discussion

It is acknowledged that the above review is very limited. The resources available for the completion of this study did not permit an in-depth analysis of issues such as:

- details on organisational structure;
- evidence of success as a function of structure; and
- funding arrangements.

Clearly from this brief review it is obvious that there is no single "model" that applies to all situations. Whatever solution is arrived at for the Canterbury Region will necessarily have its

own unique features. Perhaps the most similar set of circumstances is that offered by the Austin Technology Incubator (CEI) which seeks to promote the development of viable businesses focused on clean energy. Its partner organisations span Universities, Research Laboratories, Technology Incubators and Federal/State agencies; linked to industry participants through an Advisory Board.

Ultimately, the degree of support engendered for SETI will determine the range of functions it can perform. Access to funding will then determine to what depth these functions can be performed. This becomes a key element for future business planning. Long term secure funding will be vital to success.

3.4 Survey of Potential Members

3.4.1. Survey background and scope

A survey of potential SETI members was carried out to gauge the interest in SETI and the functions it may perform. Another purpose for the survey was to get a better understanding of the size of the industry sector in question and, finally, the survey aimed to identify other functions that might be of interest, and not previously considered.

Thus, the survey was segmented as follows:

1 General information about the respondent firm/organisation
   a Number of staff and annual turn-over
   b Products or services offered
2 Assessment of proposed functions
   a Markets targeted
   b Membership of professional organisations (such as IPENZ)
   c Assessment of proposed SETI functions
   d Suggestion of other functions not previously proposed
   e Experience with previous R&D funding

For a complete copy of the questionnaire, please refer to Appendix 2.

3.4.2 Survey results

A total of 64 questionnaires were sent out to organisations or individuals (refer to Appendix 1 for the complete list). Of those, 34 (~53%) responded. It should be noted that out of those not responding, the majority were individuals working for publicly funded institutions. This is attributed to the lower interest in the proposed functions in this sector as they are less likely to have a direct impact on the key performance indicators of this sector compared to the private sector.

Below is an analysis of the responses received:

Number of staff:
The majority of organisations (66%) employ 10 people or less. A simple calculation of the total number of staff employed by those organisations responding to the survey would be misleading, as some are based in the region but have other branches outside Canterbury or employ a large number of people but only a small minority are involved in activities related to sustainable energy technologies or services. An estimated 300 staff from within the companies that responded, are involved in the provision of sustainable products or services, for at least some of their time, in this region.

Annual turnover:
Presumably due to confidentiality concerns, not all participants responded to this question. Of those that did, 74% had an annual turnover of $5 million or less.

Products and services provided:
The types of products and services provided by those responding included:

Manufacture of:

- Burners (using a range of types of fuel)
- Combustion pollution control
- Solar water heating and cooling
- Building insulation materials
- Wind energy generators
- Lighting products
- Stirling engines

Services:

- Technical consulting
- Business consulting
- Architecture and building design
- Research services
- Design and design consulting

SETI functions:
This section of the questionnaire aimed to identify the level of support for the suggested functions which SETI may perform for its members and identify other functions and gaps in existing services available from other providers, particularly with regards to public funding.

A summary of the results regarding the responses to the suggested functions is as shown in Figure 1:

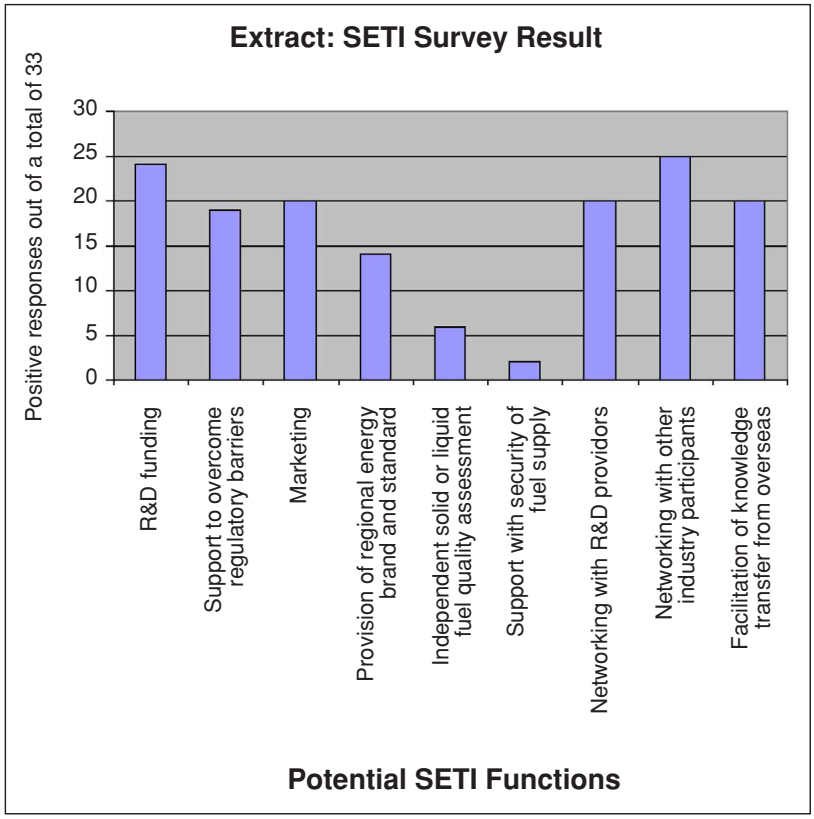

Figure 1: Questions and responses regarding potential SETI functions

Overall, there was good support for all of the proposed functions, excepting those associated with fuel supplies. The fact that some of the functions suggested on the previous page received more positive responses than others can largely be attributed to the diversity of the products and services provided by the organisations surveyed. Those functions receiving little support where only useful to a subset of those responding.

Other SETI functions:
No other functions which would be widely applicable were identified by those responding to the survey. In bringing recommendations forward, therefore, on possible future SETI functions, and taking into account comments received, the original nine categories have been consolidated into six functional areas.

Experience with public funding:
A total of 14 organisations (42% out of those which responded) indicated that they have either been directly or indirectly involved in publicly funded projects. Out of those, 8 confirmed that they were satisfied with the funding programme. The remainder did not respond, were just starting to receive funding or did not have any comment. Only one organisation responded in the negative, suggesting that it found the time required for administration of the public funding it received too time consuming given the small size of the organisation.

4 Outlook

4.1 The Business Case for SETI

Whilst it was initially intended to bring together a preliminary business case for the establishment of SETI, or some similar organisation, the research undertaken was insufficient to properly quantify the likely impact that the formation of such an organisation might have on economic activity in the region.

Instead, it has become clear that the justification for moving ahead with such an organisation would in the initial stages most likely focus on the identified need for networking and facilitation so as to:

- promote the early stage development of sustainable energy companies;
- accelerate the uptake of clean energy opportunities within the region; and
- encourage local consumer acceptance of sustainable energy technologies and services.

Through this mission, it is considered that an initiative like SETI would help to create jobs in Canterbury and help deliver upon overall sustainability goals for the region. Benefits would derive from;

- wealth generation within the region;
- maximising the use and value of the region's renewable energy resources; and
- improved environmental outcomes.

These benefits are essentially a public good, and thus the business case for SETI needs to be predicated by institutional support at both local and regional governance levels.

In this regard, the most appropriate structure for SETI appears to be that of a separately established Trust, probably operating as a not-for-profit organisation with revenue obtained from grants, subscriptions and management fees for services provided. SETI would need to retain an overhead contribution to recoup the time and intellectual resources it expends on any supported programmes in order to maintain organisational capacity and to allow it to expand future capability.

4.2 Next Steps

It is premature at this stage to proceed with the development of a full implementation plan for the organisation. It is suggested, instead, that initial focus be given to developing the organisational capability required to advance the proposal in consultation with key stakeholders.

The formation of an initial Establishment Board is recommended as a means of cementing in place the appropriate institutional arrangements and funding streams required to allow the initiative to proceed.

As a first step, the Establishment Board could comprise representatives of the three institutions which initiated this study, (i.e. ECAN, CCC and CAE) and, depending on funding arrangements, individuals representing other potential partner groups. The Establishment Board should also include independent directors appointed for their relevant technical, commercial and legal expertise as well as their networks in the region; specifically to ensure SETI's activities are aligned with other regional economic development interests.

The role of the Establishment Board would be to recommend to its foundation partners an agreed business case for establishment, including:

- Trust structure and Deed.
- Organisational arrangements and operating structure.
- Resources and funding levels.
- Business strategy and services delivery.

In the long term it is expected, subject to SETI's formation being formally ratified, that an appointment will be made of a suitable senior-level person to be responsible for establishment and start-up. This role could be supported by administration services provided either in-house or contracted out through another organisation.

4.3 Kick-Off Project

As part of this investigation, a number of renewable energy projects which are currently being proposed in Canterbury were reviewed, with the aim to identify a suitable first project for SETI to support. The suite of projects examined are described in Appendix 3.

The projects included in the Appendix are a limited selection which were identified from various communications and the in-house knowledge of the parties involved. The list is not a complete review of activity within the region, but the authors believe the selection forms a suitable basis for looking at future areas of activity.

Each of the identified projects have been analysed in respect of:

- the ability to realise the selected project in the short term (incl. likelihood to receive funding);
- the immediate applicability of the result (availability of a market); and
- the impact range of the outcome (i.e. would the successful outcome of the project only impact on a small number of businesses and/or a small part of the regional economy and population/environment or would it have a positive impact on a wider range).

On the basis of the above criteria, the proposal for a biodiesel project to investigate the long-term use of biodiesel as a fuel in public buses in Christchurch, and ultimately helping biodiesel to become a widely available and used fuel in New Zealand, was seen as the preferred first option.

This project is considered particularly suitable as a "kick-off" project for reinforcing the case for establishment of SETI. It has the potential to positively impact on both the local economy and the local environment, while providing positive publicity for SETI that will be beneficial for securing funding and, in turn, providing the basis for further institutional support.

To date, SETI is a concept only. To realise this concept SETI will require adequate funding for at least a forward two year period. Funding levels would need to be sufficient to enable SETI to develop over this period to the point where there can be confidence that the organisation will be able to sustain itself over the long term. Realising the biodiesel project will be a good starting point from which key stakeholders will be able to move forward towards formal ratification of the concept, and its ultimate establishment.

A separate proposal for funding support of the biodiesel project is attached.

5 Conclusion

An investigation into the feasibility of establishing a regional initiative to support sustainable energy businesses within Canterbury has identified a suitable scope for such an organisation and a strong case for its establishment. A review of like organisations internationally presents evidence of widespread support being given within other economies to similar organisations as proposed here; and, specifically, at the regional level for sustainable energy development and technology advancement. Generally these initiatives seek to promote the uptake of renewable energy as an economic goal.

A survey of potential participants for an organisation of this type for Canterbury found that, while there are only a few enterprises active in sustainable energy in total, there is a wide interest in the proposed functions for SETI; at least from within the private sector. The low response rate from publicly funded organisations may be considered as supportive of the establishment of the proposed organisation rather than against it, as one of the reasons for the concept is related to poor information flows between the private and the public sectors regarding the development of energy technologies and services.

Compared to many regions in other economies, Canterbury is home to only a small number of sustainable energy businesses. Despite the fact that Canterbury appears to have expertise in a range of energy technologies above the average for New Zealand on a per capita basis, the energy technology and services sector is still small. Most technologies and services are represented by one or a small handful of companies only.

As a result, the thinking developed during this investigation, is that SETI should not only focus its initial activities on the more widely applicable but somewhat generic functions originally proposed (such as facilitation of networking and information sharing) but that it should also be seen to promote individual projects, where they have obvious regional benefits. To this end a proposal for support to a biodiesel project has been put forward for consideration and, hopefully, funding commitment.

A number of steps are yet required if SETI is to be successfully formed. Once established, however, SETI should be able to assist energy technology and services companies to grow - potentially both as a supplier to the region and beyond - and at the same time help Canterbury become a more sustainable region. Based on the feedback from the survey of potential participants and our review of international trends, it is recommended that CCC and ECAN advance with the formation of SETI.

Appendix 1: SETI Database

Technology Providers and Fuel Producers

ASCO Carbondioxide Ltd
BCG Fuels Ltd
BioDiesel Fuels NZ Ltd
City Firewood
Clean Combustion Technologies Ltd
Crusaders
Enersave Products Limited
Engineering Dynamics
Fonterra Cooperative Group
Fletcher Building Holdings Limited
General Cable New Zealand Limited
Mainpower NZ Ltd
Meridian Energy
Natural Systems
Pellet Fuels NZ Ltd
Red Barn Vehicle Design
Terra Lana
Thermocell
Tropicair Heating Ltd
Waste Solutions
Whisper Tech
Windflow
WH Harris
Solid Energy New Zealand Limited

Service Providers

Applied Physics Limited
Buck & Associates
Christchurch Electrical Limited
Community Energy Action
Datacol (NZ) Limited
Design Industry
Eco Energy Construction
Eco$ense Limited
Enercon
Energy Billing Services Ltd
Energy Mad
Flaire Lighting
Honda Cars Christchurch
Natural Systems
OCEL
Orion New Zealand Limited
Power Save Marketing Limited
Preston Consulting
Restore NZ
Russell Devlin Architect
Solar Electric Specialists
Solvent Rescue
Transfield Worley Ltd
Tyco Services

Research Providers

Aqualinc Research Ltd
Canterbury University
CPIT
Industrial Research Limited
Landcare Research New Zealand Ltd
Lansdowne Resource
Lincoln University
NIWA

Regulatory bodies, Councils and Government Agencies

CCC
ECAN
EECA
MfE
NZTE/Investment NZ
FRST

Others

Cabinz/Selwinz Limited
Cornerstone International Limited
David Shackleton
Evolution Tecnologies
NZ Home Heating Association
NZ Photovoltaic Assoc
Perce Bull
Peter Rutledge
Sustainable Cities Trust
The Natural Step NZ Foundation
Tim Armitage

Appendix 2: SETI Questionnaire

1 General information about your organisation

1.1	Name of organisation and contact:
1.2	Current number of staff:
1.3	Turnover in 2003:
1.4	Which energy related services or products does your organisation provide?

2 Information regarding the benefits of an energy technology cluster to your organisation

2.1	Are you selling your services or products outside this region? If not, would you consider doing so with assistance (eg. support with trade fairs)?	
2.2	Do you belong to any professional associations or organisations related to your activity (eg. Employers Chamber of Commerce, IPENZ etc). If "yes", who are they?	
2.3	Please tick which of the following services you would consider beneficial to your organisation	please tick fields below as appropriate
2.3.1	R&D and Start-up funding or support to receive such funding	
2.3.2	Support to overcome regulatory barriers for your services or products	
2.3.3	Marketing support nationally and internationally	
2.3.4	Provision of a regional energy brand and sustainable energy standard	
2.3.5	Independent solid or liquid fuel quality assessment or control	
2.3.6	Support with security of supply of solid or liquid fuel	
2.3.7	Facilitation of access to R&D providers and investors	
2.3.8	Facilitation of networking with other organisations involved in this industry	
2.3.9	Facilitation of knowledge transfer from overseas	
2.4	Please list any other services that you would like to see the technology cluster to provide for your organisation.	
2.5	Have you used any similar service provided by government agencies (eg. marketing support by NZ Trade & Enterprise, R&D funding from FRST, incl. PGSF funds etc), if "yes", which particular service did you receive.	
2.6	If "yes", were you satisfied with the service received and the process involved in applying for it?	
2.7	If you were not satisfied with the service received, why not?	

Appendix 3: A Selection of Sustainable Energy Projects within the Canterbury Region

1 Biodiesel as a fuel for Christchurch's public buses

Technology factors

Both the production and use as an automotive fuel are well-proven. However, only limited experience with this fuel exists in NZ.

Commercial Availability

Biodiesel is available in limited quantities. However, a Christchurch company claims to be able to produce biodiesel, which meets the proposed NZ Biodiesel standard.

Risk Factors

Biodiesel produced to an established quality standard presents no serious technical risk to its introduction, as long as certain precautions are adhered to, such as awareness of cloud point.

Economic Factors

Biodiesel can be made from tallow or vegetable oils, which are also used for soap, food and greases and are traded internationally, not unlike crude oil. The cost of biodiesel relative to the cost of conventional diesel depends on the supply and demand of the respective feedstock for these fuels. According to EECA studies, at present price levels, biodiesel should be available for similar or lower prices than conventional diesel. If the trial is successful, a market for biodiesel is immediately available.

Environmental Factors

Uncosted benefits from using biodiesel blends will be cleaner emissions and therefore improved air quality.

2 Algae to biodiesel

Technology factors

This is a largely unproven route for the production of biodiesel. It uses the nutrient value of waste water (e.g. sewage effluent treatment ponds) and carbon dioxide from the atmosphere to grow algae. The oil lipids fraction is then processed into a biodiesel.

Commercial Availability

Biodiesel from this source is not available, although encouraging first trials have been conducted at Bromley with the co-operation of the Christchurch City Council (Solvent Rescue 1999 Ltd).

Risk Factors

Biodiesel from this process, if produced to an established quality standard, would presents no serious technical risk to its introduction. There is a slight risk that the oil produced was unable to meet the current standard for biodiesel.

Economic Factors

The production of biodiesel by this method requires more research and development before usable quantities might be available for trials.

Environmental Factors

Uncosted benefits from using biodiesel blends will be cleaner emissions and therefore improved air quality. There is no risk of competing uses for the waste water so successful exploitation would have a positive impact of cleaning water and recycling carbon dioxide.

3 Irrigation channel and run of the river hydro

Technology Factors

1 TrustPower has assisted the development of a small-scale, low-head water turbine for local manufacture by Mace Engineering.

2 Natural Systems has a signed heads of agreement with HydroVenturi Ltd of the UK for a no-head hydro generator (www.hydroventuri.co.uk).

Commercial Availability

1 Available from mid-2005.

2 Demonstration site planned by year-end 2005.

Risk Factors

1 Ownership acceptance of target landowners, control and operation with the local network.

2 NSL plan to retain ownership and use proprietary control and operation with the local network.

Economic Factors

Capital costs likely to be the biggest hurdle to widespread uptake. At present electricity prices only remote locations without existing electricity line access are likely to be economically viable.

Environmental Factors

1 Minimal impact. Water screen could impact on water life.

2 Positive impact. Air injection and no impact on water life.

4 Biogas from dairy sheds/ ice bank storage

Technology Factors

Natural Systems of Christchurch has a provisional patent for an integrated dairy energy system, which uses the cow shed manure through anaerobic digestion to produce stored heat and milk cooling ability. Refer to article "Not so Dirty Dairying" July/ August 2004, e.nz magazine of the Institution of Professional Engineers New Zealand.

Commercial Availability

Demonstration site planned for 2006.

Risk Factors

To produce an anaerobic digester which is efficient and productive 24/7 all year. Reliable combustion generator and milk cooling ability through ice-storage or similar technique with minimal maintenance requirements.

Economic Factors

Capital cost and operating costs yet to be determined.

Environmental Factors

Lower farm methane emissions. Effluent disposal eliminated and lower pathogen count from biosolids returned to pasture.

5 Pellet fired WhisperGen

Technology factors

Coupling local proprietary Stirling engine with a wood pellet gasifier to provide combined heat and power for domestic homes.

Commercial Availability

Whisper Tech of Christchurch has its WhisperGen commercially available in limited quantities. Wood pellet gasifier has been designed and tested by Fluidyne.

Risk Factors

Technical issues with integrating the two to provide a working prototype.

Economic Factors

Research funding required. Capital and operating costs yet to be determined.

Environmental Factors

Domestic combined heat and power from a sustainable fuel source. Possible issues with combustion emission levels.

6 Pyrolysis of Intractable Wastes to Energy

Technology factors

Safe destruction of unwanted waste (hospitals, airport and sea port quarantine waste) to derive heat and/or power. Several international examples of high performance energy from waste systems.

Commercial Availability

Demonstration systems and fully commercial.

Risk Factors

Overseas technology provider.

Economic Factors

Commercially viable, depending on scale of operation.

Environmental Factors

Emissions as low or lower than EU standard for waste to energy plant.

7 Ground source Heat Pumps using Heat Pipes

Technology factors

Heat pipes and heat pumps are commercially available.

Commercial Availability

Research needed on heat pipes to provide a high conductivity path from ground sources to the heat pump. Thermocell of Christchurch has heat pipe expertise.

Risk Factors

Minimal technical integration issues. Ground source heat pumps are commercially available but do not use heat pipe technology as the heat conduction path.

Economic Factors

Research funding required to further investigate.

Environmental Factors

Non-polluting energy source for lower temperature heat. Possible source of power generation where high temperature geothermal ground sources exist.

Sustainable Technologies

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Defining Sustainable Technologies

Sustainable technology projects are designed to improve human well-being and preserve or restore the ecosystem through looking at how resources are extracted or harvested and how materials are manufactured from these resources, transported, used and finally discarded.

Clean, sustainable technologies underpin diverse products and services that deliver superior performance at lowest cost, greatly reduce or eliminate environmental impacts and, in doing so, improve the quality of life. These profitable, ecologically balanced, environmentally sound or socially responsive solutions will ensure that New Zealand prospers.

The impetus for business to adopt a sustainable business approach comes in part from customers and local government but is largely driven by management with support from staff.

Addressing sustainable business for NZ companies means:

- Reducing raw material use
- Decreasing adverse effects
- Reducing manufacturing costs
- Improving long term performance and company survival
- Enhancing environment outcomes
- Continuous learning
- Overcome existing operational issues

With the expected outcomes to include:

- Simpler processes with more automation
- Lower capital costs
- Improved efficiency
- Lower operating costs
- Larger plants
- Greater reliability
- Less people

Industry will implement technologies only where increased value or commercial advantage emerge. In the absence of demand from industry for resource efficient goods and services, it is difficult for the environmental sector to justify investment in new fields of expertise or new products. That demand may come as a result of legislation or from demands from consumers.

The current government has a goal for economic growth to the top half of OECD countries and this will occur in its context of sustainable development. If set within an appropriate policy framework this commitment will function as a driver for the sustainable technology sector.

Profile of Existing Sustainable Technologies

A new set of markets are emerging, some well established, others just getting started, and most are growing rapidly. These markets include:

- Renewable Energy
- Closing The Loop (Recycling, Reuse, Resource Reduction; 'Closed Loop' and Zero Waste)
- Life Science
- Agriculture
- Earth Science
- Manufacturing
- Alternative Transportation
- Natural, Nutritional & Organic Products

The first seven technology areas appear to show the greatest potential for rapid growth and disruptive technology breakthroughs.

Key Business Considerations

- Small (<10 staff) companies make up 90% of the New Zealand businesses
- Small, medium (10-99 staff) and large (>99 staff) have different capacities to engage in sustainable business development. The large ones are more able for example, to develop environmental policies, afford formal training, and implement environmental management systems.

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- Small and medium enterprises are the driving force in business. The majority of businesses in New Zealand employ less than 50 staff. Many business leaders can see the opportunity to innovate and develop products and services in line with sustainability principles, but lack the time and resources to explore sustainable development fully.
- NZ companies all anticipated significant growth over the next 5 to 10 years.

It is important to ensure the maximum potential has been extracted for New Zealand companies. Improvements here will be important to sustain the county's clean, green image, and to improve the capacity of its business sector.

Barriers to the Uptake of Sustainable Technologies

Barriers to the uptake of sustainable technologies include:

- Limited business capacity due to small market demand
- Limited funding for research and business development, and general lack of development and venture capital
- Institutional barriers to change and innovation
- Uncertainty on how to measure the success arising from the implementation of sustainable technologies (especially in social capital gain)
- Lack of true cost pricing. Presently, for example, the costs of waste are externalised and now being met through subsidised infrastructure and by the loss of environment.
- Limited Government leadership. There is a need for robust policy that flows through into environmental standards, regulation and enforcement, education and awareness, and coordination of sectors.
- A key issue for business in adopting sustainable practices is the issue of who manages the business risk.
- There are new risks of terrorism, corporate corruption and weather/climate variation to consider.

Guiding Principles for Implementing Sustainable Technologies

Two considerations appear fundamental:

A *systems concept* is fundamentally important in managing for sustainability.

A *scale perspective* recognises the importance of finding the larger limits within which decisions on sustainability must be made to have effect (and several of these can exist such as regional, national and international) and to forewarn of impacts.

In the current NZ context Sustainable Technology Programmes can be developed around meeting internal NZ needs first and engaging at a national level focussing on:

- Emerging technologies and facilitating early adoption of advanced technology solutions
- Existing technologies that can be implemented with benefit to business
- Embedding technologic solutions within a management framework that delivers a systemic approach to sustainable business management
- Using a supply chain framework for all engagements in sustainable technologies. Supply chain sustainability as the overriding concept, is applicable at any scale of business.

  This means: improving the performance of the business's own operations; ensuring that the goods and services provided by suppliers are sustainable and working with suppliers to increase efficiency and competitiveness; and, working effectively with customers and sales channels to design sustainable products and services.
- Taking a systems/holistic approach for: promoting full understanding, recognising government policy and business imperatives, linking to sources of NZ capacity wherever it is.
- Assessing existing activities and processes in detail: NZ strategies for sustainable technologies, NZ business opportunities, NZ business priorities for sustainability.
- Identifying best success areas for interventions
- Building on existing business commitments where value can be added. There is a need to identify which offers the most opportunity/value, farming, industry, health sector, etc
- Develop natural partners
- Large business is more advanced here than medium or small ones. Leadership is largely internal, coming from management and staff, with pressure from the customers and local governments, with less pressure from central government.

CAE is interested in engaging in Sustainable Technologies along these principles, acting as an integrator, to raise awareness, to broker knowledge, and to pioneer new solutions.